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# Leibniz on Diffusion, Extension, and Force

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# Leibniz on Extension as Diffusion of Forces

# Introduction

- “force ... is the essence of substance, and this is the nub of Leibniz’s solution to the labyrinth of the continuum”
  - Richard Arthur, *Monads, Composition, and Force* (2018), 291.
- Since the **1690s**, Leibniz’s struggle with the continuum has taken a significant turn in his work on dynamics and its ontology.
- It is after this period that Leibniz frequently mentions ‘**diffusion**’ or ‘**repetition**’ of forces as a kind of intrinsic efficient cause or formative reason for the extension and the continuity of the body.
- However, Leibniz seems to have not explicitly explained or thoroughly answered how extensions are formed from forces.
- In this presentation, I will clarify the late Leibniz’s view on **how the extension of a body is formed from the diffusion of forces**.

# My argument

- For Leibniz, the tentative resolution of the ‘labyrinth of the continuum’ in the late 1690s to 1700s lies, I believe, in the ‘harmony’ or structural correspondence between the different dimensions or scales:
  - (1) **actual reality**, in which belongs primitive forces or entelechies or Monads
  - (2) **actual phenomena**, which are constituted by derivative forces, whose diffusion is considered as physical extension
  - (3) **apparent phenomena**, which contain visible extensions such as colors (whiteness of milk etc.) and other secondary properties
- The claim of Leibniz that there is an original extension as a diffusion of the true nature of the body, which is spoken of as a relationship between primitive and derivative forces, and between active and passive forces, is ultimately seen in the ‘**resulting** (*resultans*)’ relation: from the constituents in the actual reality to its phenomenal consequences.

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# Texts around 1690s

1689 *Principia Logico-Metaphysica (Primae Veritates)*

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1691 letter to Antonio Alberti

1692 *De duplici via philosophandi*

1695 *Specimen Dynamicum*

1699 *Animadversiones ad cartesii principia*

# 1. Historical development § 1 [1689]

- By 1690, Leibniz had achieved a formal expression of his new theory of forces in the *Phoronomus* and the *Dynamica* (1689).
- In the *Principia Logico-Metaphysica* of 1689 (a.k.a. *Primae Veritates*), written at the same time or slightly before them, Leibniz insisted on the thesis that the “substantiality” of bodies must be grounded in an unextended principle. For extension, motion, and the bodies themselves, insofar as they consist of these alone, are not substances but true appearances (Antognazza, p. 305).
- **The unextended principle**, which is here required apart from extension, **is not yet called “force”, but is called “form or Species (forma vel Species)”** (A VI 4, 1648).

# 1. Historical development § 2 [1691]

- In a letter to Antonio Alberti [March 23, 1691](Erdmann: “Lettre sur la question si l’essence du corps consiste dans l’étendue”), Leibniz argues that irrationality follows if we assume that the essence of body consists only in extension (A II 2, 392–8).
- ✓ For it is nothing less than an affirmation that “the essence of the body consists in its length, width, and depth”(A II 2, 394).
- It is not possible to explain all modifications of body from extension alone, which is nothing but a **purely geometric concept** (A II 2, 395).
- In particular, it is impossible to derive **Resistance**, hence its Natural Inertia (Inertie Naturelle), that body should have in addition to its extension. Therefore he says it is not possible to explain, in a manner consistent with experience, the speed and direction of bodies that occur when they collide. And based on the law of conservation of *vis viva* already derived by Leibniz, he clearly asserts that “force” is required as the essence of body in addition to extension (A II 2, 396).



# 1. Historical development § 2 [1691]

- ✓ Leibniz also states that if the essence of body resides only in extension, it is not known how the law of conservation of the same amount of force can be derived (A II 2 397).
- He argues that force is something different from extension, and that it is from force, not from extension, that action and passion, i.e., *antitypia*, can arise (A II 2, 397f.). And contrasting extension with substance, Leibniz says,  
“In general, the true nature of substance is rich, giving rise to series and varieties. Instead, extension gives only possibilities and does not encompass any activity” (A II 2, 398).
- **This is not to say that extension is a mere fiction, but rather that it is only apparent unless it is based on some substantial foundation in force, and therefore in mental principles, as Leibniz actually believes.**

# 1. Historical development § 2 [1691]

- In the letter to Alberti, the relationship between extension and force is not explicit, but only suggested by his idea that **force is much more primitive than extension**. Here, force is presented as a metaphysical concept on the same level as substance and action, but the relationship between them is also not clarified.
- However, the “force” described here is the metaphysical concept of force as the substantial basis of body. It requires that **extension has force as a fundamental, non-extensional basis more fundamental than the extension itself**.
- In particular, Leibniz requires metaphysical force as the principle of the true unity of body, which cannot be satisfied by extension. Since extension is infinitely divisible, extension can only give the appearance of body, and can only lead to a multitude (A II 2, 398).

# 1. Historical development § 3 [1692]

- In *De duplici via philosophandi* (On the twofold way of philosophizing) of 1692, Leibniz discusses the concept of “diffusion (*diffusio*)” as the nature of the continuum (AVI 5 VE, N.2148).
- There, “**extension (*extensio*)**” is defined as “**the continuous and simultaneous diffusion of the same nature**”.
- ✓ The “twofold way” of philosophizing: one is the way of passive matter or resistance (*resistantia*), and the other is the way of active form or entelechy (*entelechia*). In this ‘twofold way’, as in the context of criticism of Cartesian, the nature of body must be grasped not only by extension, i.e., “the continuous diffusion of the same nature,” but also by ‘the same nature’, the very thing that is being diffused.
- Leibniz holds that the extension of body and its activity is formed by the diffuse presence of passive force *i.e.* resistance, and of active force *i.e.* entelechy, everywhere within the body.

# 1. Historical development § 4 [1695]

- It was in *Specimen Dynamicum* [: SD] (1695) that **Leibniz identified substances with primitive forces** and developed a full-scale metaphysics of force.
- Leibniz emphasizes in SD that logical and geometric axioms alone are insufficient to derive all truths about bodies. Instead, a metaphysical and formal principle is required. **According to him, “it does not matter whether we call this principle ‘form’ or ‘entelechy’ or ‘force’, as long as we remember that it can only be explained through the notion of forces”** (GM VI, 241f.).
- Leibniz holds that there exists in body, besides or rather prior to extension, force. And as that force, he says, there must be endeavor (*conatus*) or striving (*nisus*). Then he talks about the meaning of extension:  
“For to act is the mark of a substance, and extension, far from being able to comprise substance, indicates nothing other than the continuation or diffusion of an already presupposed striving and counter-striving (i.e. resisting) substance” (GM VI, 235 / AG, 118)

# 1. Historical development § 4 [1695]

- Here, extension is specified as the continuation or diffusion of substance that strives or resists. We can find the same definition at the beginning of the second part of SD.

Therefore, we have shown that there is a force of acting in every substance, and that there is also a force of being acted upon [*patiendi*] in every created substance, and that the notion of extension is incomplete in itself, but is relative to something which is extended, something whose diffusion or continuous repetition extension indicates; further, we have shown that the notion of extension presupposes the substance of body, which involves the power of acting and resisting, and exists everywhere as corporeal mass [*massa*], and that the diffusion of this substance is contained in extension. (GM VI 247 / AG, 130)

- Here again, extension is defined as diffusion or continuous repetition of something extended. And Leibniz insists that the notion of extension is dependent on its substance, and thus the notion is incomplete and relative.

# 1. Historical development § 4 [1695]

- Leibniz regards extension as a mathematical notion. The intention is to contrast the mechanists' or Cartesian notion of extension with the formal principle :
  - ✓ "... we must admit something metaphysical, something perceptible by the mind alone over and above that which is purely mathematical and subject to the imagination, and we must add to material mass [*massa*] a certain superior and, so to speak, formal principle" (AG, 125). Here, he considers the extension, which was conceived in a mechanistic way, "is purely mathematical and subject to the imagination".
- He says: "Whatever there is in corporeal nature over and above [praeter] the object of geometry or extension reduces to this" (AG, 118). In this sense, a distinction must be made between **physical extension (or extended)**, which is related to substance and abstracted from it, and mere **geometrical extension**, which is derived from our thought.
  - ✓ Leibniz's distinction between mathematical and physical continua is discussed in detail in his letter to Fardella (Sept. 13.1696), A II 3, N. 72.

# 1. Historical development § 4 [1695]

- At the beginning of the Second Part of SD, he states (similarly in *Primae Veritates*) that extension itself is considered to be a mere geometric concept, for “we must admit that it is impossible that bare extension, containing geometrical notions alone, is capable of action and passion” (AG, 130).
- Nevertheless, what is essential is that, in nature, things that have a physical extension, and thus “space, time, and motion are, to a certain extent, beings of reason, and are true or real, not *per se*, but only to the extent that they involve either the divine attributes (immensity, eternity, the ability to carry out works), or the force in created substances” (AG, 130).
- In other words, **the physical extension is, to a certain extent, a being of reason (*ens rationis*) that owes its reality to the substantial force implanted in our intellect by God.**

# 1. Historical development § 4 [1695]

- ✓ Once such a formal principle is established from which the laws of mechanics are derived, we are allowed to explain all corporeal phenomena by efficient and mechanical causes.
- ✓ Thus, the same is true for extension: once we have identified the primitive principle that forms extension, we should take no account of souls or entelechies for explaining corporeal phenomena (cf. GM VI 247/ AG, 126).



# 1. Historical development § 5 [1699]

- In *Animadversiones ad cartesiani principia* (1699), Leibniz concedes that in every substance there is a principal attribute that expresses its essence (I § 52, A VI 5 VE, N. 3130 / L, 390).
- Though he claims that he does not see it proven anywhere that extension constitutes the common nature of bodies.
- **There are also some attributes that cannot be considered to be derived from extension alone, such as motion or action [activity], resistance or passive forces, and natural laws** related to the motion or collision of bodies:  
"It is certain, however, that neither motion or action, nor resistance or passive force, derive from extension."

# 1. Historical development § 5 [1699]



- **The notion of extension is not a primitive one, but a composite, and therefore derivative concept** from which further analysis or resolution is possible.  
“For an extended being implies the idea of a continuous whole in which there is a plurality of things existing simultaneously.”
- Moreover, **extension, a relative notion, requires something that extends or continues, as in milk the whiteness**: it is the repetition of this something, which forms the extension.
- Thus he says, “mobility or ἀντιτυπία cannot be understood by extension alone, but it is necessary a subject which extends.”

## 2. An Examination

Texts mainly referred

- SD: Specimen Dynamicum (1695)
- LDV: The Leibniz – De Volder Correspondence (1698–1706)
- PM: On Body and Force [*Prinicipia mechanismi ex altiore fonte*, A VI 5 VE, N.2642] (1702)

# The Origin of Homogeneity or Uniformity of Extension

- The formal principle, and thus primitive forces, are distinguished from each other and can never be uniform. Since Leibniz requires **heterogeneous entelechy** as the reason for the diversity of phenomena :
  - “unless matter is heterogeneous (which happens through entelechies), no variety of phenomena can arise, and equivalent things would always be substituted for one another.”[31 Dec. 1700] (LDV, 211)
- Then, how can we explain the basis for the homogeneity or uniformity of the extension resulting from diffusion or repetition?
- We can consider this question in the case of the measurement of force (in SD):
  - "the true art of measuring, ..., consists in arriving, at last, at something homogeneous, that is, at an exact and complete repetition not only of modes, but also of realities." (GM VI, 248f./AG, 127f.)

# The Origin of Homogeneity or Uniformity of Extension

- In this case, the force is measured by the repetition of a single unit of force. (The true measurement Leibniz has in mind here is the law of conservation of *vis viva*.)
- Since primitive force cannot be the unit of measurement, **it is derivative force that should be measured.**
- Similarly, **the extension will be formed by the repetition of the same unit of derivative passive force.**
- In extension, Leibniz conceives of many in one (*plura uno concipio*), namely continuity and coexistence. And he says, “for there to be extension, there must be something that is repeated continuously, or many things whose coexistence is continuous.” (LDV, 210f.)

# Principia mechanismi, 1702

- Our question was: what is extension? More specifically, **what does Leibniz mean by the diffusion or continuous repetition by which extension is defined?**
- While all of the above texts we saw are fragmentary, a more penetrating look at this question of the nature and origin of the continuum is found in an article of May 1702, entitled *Principia mechanismi ex altiore fonte* (Principles of Mechanics from a Deeper Origin) [A VI 5 VE, N. 2642]. [Hereafter abbreviated as PM]
- In this article, Leibniz criticizes the mechanical philosophy of the Cartesian school, especially the position that places the nature of Body only in extension. And he interprets the continuum and extension in terms of his new dynamics and his reformed metaphysics.

# Principia mechanismi, 1702

- The concept of extension is always related to something that extends. Extension is the continuous aspect of the diffusion or repetition of it.
- There are two types of continuum constituted as the continuous aspect of diffusion or repetition: the **successive** (time or motion) and the **simultaneous** (space or body).
- **Time** is said to endure and **space** is said to be extended. But there is no essential difference in that time adds nothing to the duration and space to the extension, just as we say that numbers can be counted.

# Principia mechanismi, 1702

- However, space differs in that it is constituted from the simultaneous coexistence of **different** things, while extension is the simultaneous and continuous diffusion or repetition of **the same** nature.
- Moreover, there are two types of extension: **apparent extension** as continuous diffusion and **original extension** diffused through the matter.
- Apparent extension includes color, weight, and malleability (of golds), while original extension includes **resistance** or **impenetrability**.



# Principia mechanismi, 1702

- Leibniz further questions the true nature of diffusion. Assuming that not only matter but also form exist in Body, he questions the fundamental principle of both.
- For the fundamental principles, he recognizes resistance, *i.e.*, **passive force** or matter as the principle of impenetrability, and form or entelechy as **active force**.
- Leibniz further states that there is the *dynamikon* or potential force (τὸ δυναμικὸν seu *potentia*) in bodies as the fundamental principle of passive and active forces.
  - In a letter to De Volder in April 1702, the same year as the PM, Leibniz says that “just as the idea of the number three is not sufficient to understand three things, so the idea of extension or diffusion is not sufficient for understanding the nature whose diffusion it is”. This nature, for Leibniz, consists in the “*dynamism* (τὸ δυναμικόν), from which there is action and passion”(LDV 241).
  - ✓ Max Jammer, *Concepts of Force*, Dover 1999, Ch. 3, p. 34: "In contrast to our modern terms "force," "power," "activity," the Greek word *dynamis* signifies therefore not only transitive action or transeunt activity, but also passive susceptibility and receptibility."

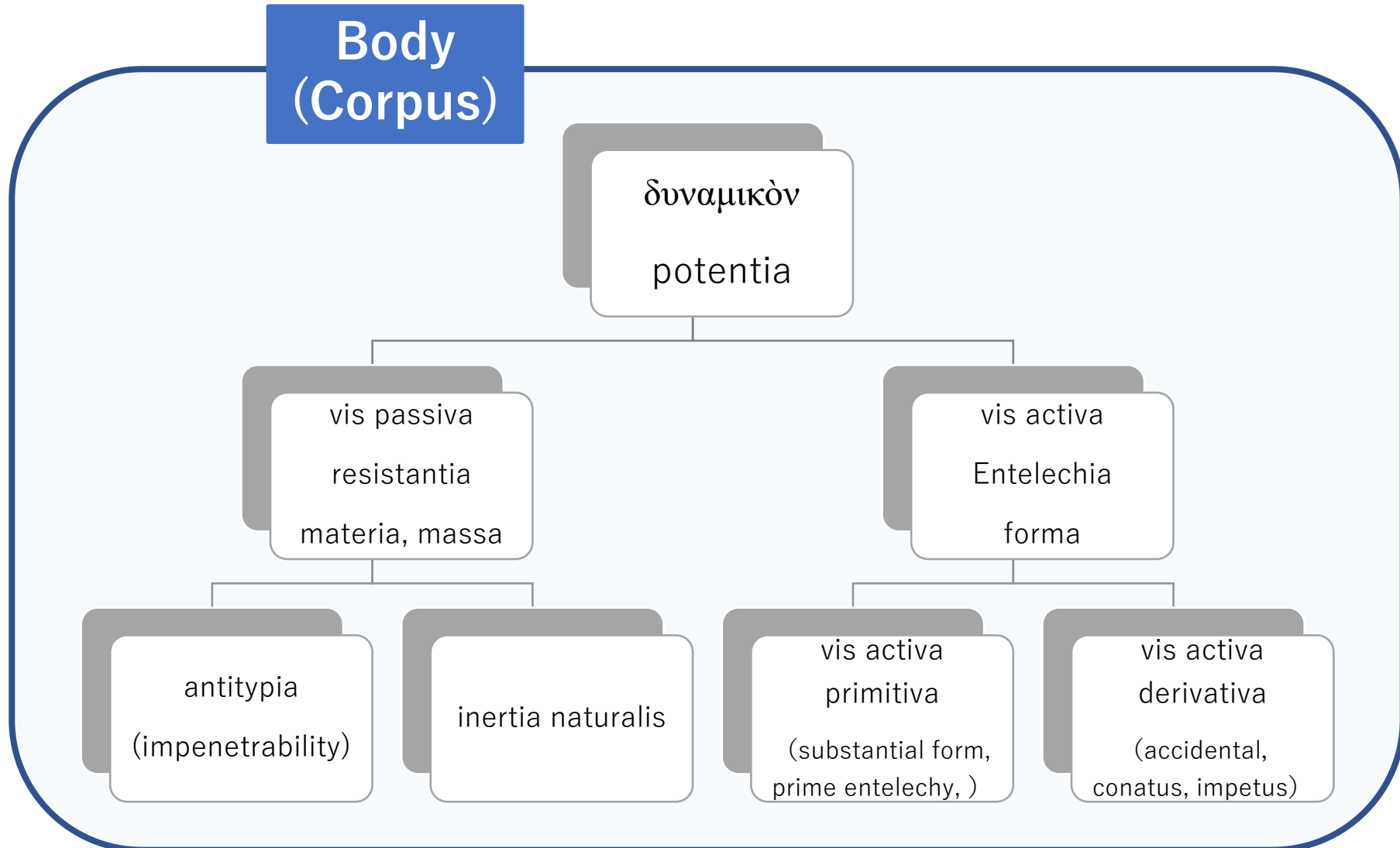
# Principia mechanismi, 1702

- The **dynamikon** is the most fundamental force that brings form and substance to things and is naturally innated in them as the principle of all laws of motion.
- The **passive force**, being everywhere the same, and thus defined by homogeneity and uniformity, gives rise to resistance or inertia as a simultaneous repetition of the same nature.
- Thus, **extension is formed as a simultaneous and continuous diffusion or repetition of the passive force of the dynamikon**, the fundamental potential force that is naturally implanted in matter.
- Extension is characterized by **homogeneity** or **uniformity**. And as an apparent continuous diffusion, extension is manifested as color and weight, while as an original or intrinsic extension, it is manifested as resistance, impenetrability, or inertia.

# Principia mechanismi, 1702

- In his PM, Leibniz, on the one hand, takes the side of Cartesianism on this point, asserting that **all phenomena of natural bodies are mechanical**.
- On the other hand, he actively introduces Aristotle's '*entelechia*' as a **dynamical principle**.
- Thus, as the origin of the laws of motion of all bodies, Leibniz revives the dynamic principle, called *entelechia* in antiquity, as '*vis activa*', and also sees the origin of continuity in it.

# Leibniz's Analysis of Intrinsic Forces in Body



# Leibniz - De Volder Correspondence [1698-1706]

- In the letters to De Volder, Leibniz repeats some of his claims in the 1690s, which we saw above.
  - Substance cannot be constituted from extension alone, since the concept of extension is incomplete.
  - “extension is resolvable into plurality, continuity, and coexistence, ... . Plurality also belongs to number, and continuity also to time and motion, while coexistence is only added in an extended thing.”
  - “something must always be assumed which is continued or diffused, such as whiteness is in milk, color, ductility and weight in gold, and resistance in matter.
  - “what is extended has no unity except in the abstract”

[3 April 1699](LDV, 73)
  - “extension is nothing but an attribute of an aggregate resulting from many substances”

[6 July 1699](LDV, 101)

# Extension in LDV

- Extension is not a substance but **an attribute** that presupposes a force which is the principle of action of substance.
- For Leibniz, the concept of extension is not primitive but **derivative**, which can be further analyzed: “[extension] is resolved into plurality (which it has in common with number), continuity (in common with time), and coexistence (in common even with things that are not extended).”(LDV, 107)
- For him, extension is nothing more than a **unity** that results from a multitude of substances which itself is a mere aggregatum if without a true unity, that are composed into a whole one **by the action of thought**. (LDV, 107-109)
- Leibniz recognizes neither inertia nor motion in extension. In extended matter, both are recognized, but not in extension.

# Extension and Extended

- The active principle is the substantial principle, which constitutes the **extended**. Leibniz says again that “**primitive force** can be neither extension nor a mode of it, and it **does not act on extension, but within that which is extended**”(LDV, 109).
- Therefore, the active principle does not constitute (directly) the extension itself. Then, what does an extension consist of? Is it “constituted” at all?
- As Leibniz said: “the connection between the parts of any body will be no more necessary than that between the parts of an army”, no actual parts of an extended can have a necessary relation to each other. Thus, the primitive active force or entelechy does not compose the extension itself. No *conatus* or derivative passive force, which can be summed up to form an *impetus*, can **truly** constitute an *extensum*. Therefore, Leibniz believes that “true unity” must derive only from a simple substance, *i.e.*, “monad” (LDV, 127).

# Status of Extension

- However, Leibniz does **not** believe that there is no relationship **between entelechy and extension**. Between them, he does not see any necessary connection or physical causality, but **he does see a certain correspondence**.
- Namely, it is a **pre-established harmony** between soul and body.
- Extension, is not a substantial thing but something modal, like number or time. And it is not a concrete thing (*entia concreta*) or actual matter that “is an aggregate of things which contain entelechies”, but merely an **abstract entity** (*entia abstracta*) that designates “a possible continuous plurality of coexisting”.  
“Besides, accurately speaking, extension is merely something modal (*modale*), like number and time, and not a thing, since it abstractly designates a possible continuous plurality of coexisting things” (LDV, 131).
- Still, extension is not a mere mode of substance but something **invariable**:  
“extension, in my sense, will not be a mode of the substances from which it results, since it is invariable and designates a numerical determination of things, which remains the same under any change whatsoever” (LDV, 211–213)



# Extension as abstract mathematical entity

- Extension itself is something **abstract**, distinguished from an extended concrete. We think of an extension in a manner separated from things like duration or number. (LDV, 225)
- For Leibniz, entelechy is the only principle that gives rise to "true unities" (*vera unitas, unum verum*). It is distinguished from that whose unity is from **thought**: arbitrary unities (*arbitrariae unitates*), as used in mathematics, and apparent beings (*ens apparens*) or beings through aggregation (*ens per aggregatum*), as in a flock or an army. (LDeV, 261)
- Thus, **extension has only the status of a mathematical unity in that its unity is derived from thought and, therefore, arbitrary.**

# ✓ Two type of extension or diffusion

Leibniz says that extension or diffusion (*diffusio*) can be understood in two senses: with respect to **time** and with respect to **place**. That is, the diffusion of activity is power (potentia) if taken in terms of time, speed if taken in terms of distance.

“Just as extension of action, i.e., *diffusion* can be understood in two different ways, so you show that the *intension* can be taken in as many ways, and that, together with the corresponding extension this is sufficient for the total measurement. So if the extension of an action is taken in terms of the time, then the intension is the power. But if the extension of the action is taken in terms of the distance, then the intension is the speed” (LDV, 149)

- For Leibniz, extension is “nothing other than a continuous order of coexisting, as time is a continuous order of existing successively.” (LDeV, 199; cf. 3<sup>rd</sup> Letter to Clarke, Leibniz-Clarke Correspondence)

# What is diffusion? And what is diffused?

“I intend the **diffusion** that I conceive of in extension, ... to be nothing other than a **continuation in which the part is similar to the whole**, as we conceive of whiteness diffused in milk, and the same direction everywhere in a straight line, and equal curvature in the circumference of a circle. But, in fact, my unities, i.e., simple substances, are not diffused (as we commonly conceive of the flowing of a point), nor do they constitute a homogeneous whole, for the homogeneity of matter is produced only by an abstraction of the mind, when they are considered as only passive and, therefore, as incomplete.” [Jan. 1705?](LDV, 323)

Arthur (2018) p. 12: “**The extendedness of body, ..., consists in a diffusion of the derivative passive forces resulting from resistance to the active forces in every actual part of the body.**”

# derivative forces as the ‘results’ of primitive forces

- The primitive entelechy does not impel the mass of its body by itself. Rather, it constitutes a monad by combining with a primitive passive force and perfecting this passive force.
- However, there is **no causal influence** between the entelechies. The derivative forces, which work in phenomena, *i.e.*, resulting aggregate (aggregatum resultans), result from the primitive forces, just as phenomena consisting of aggregates result from the reality of monads. (LDeV, 261)
- Here, “**resulting** (consequence)” is **not a (physical) causal relation** between substances or between derivative forces within the same level of phenomena, but a certain **correspondence** between the reality to which the monads belong and the phenomena to which the bodies belong. That is, a **reflectional/projectional relation** between the foundation and its consequence.

derivative forces as the ‘result’ of primitive forces

“And indeed, derivative forces are nothing but modifications and echoes (resultationes) of primitive forces.” (LDV 262–3)

Derivative forces are thus stipulated as ‘**results**’ or ‘**echoes**’ of primitive forces. This relation of ‘**resulting** (*resultans*)’, which could be regarded as an intrinsic efficient cause, is the key to the Labyrinth of the continuum:

“And although these divisions proceed to infinity, nonetheless they all result from certain primary constituents, i.e., from real unities, though infinite in number. But accurately speaking, **matter is not composed of constitutive unities; rather it results from them**, since matter, i.e., extended mass, is nothing but a phenomenon founded in things, like the rainbow or the perihelion.” (LDV 302–3; Emphasis is mine.)

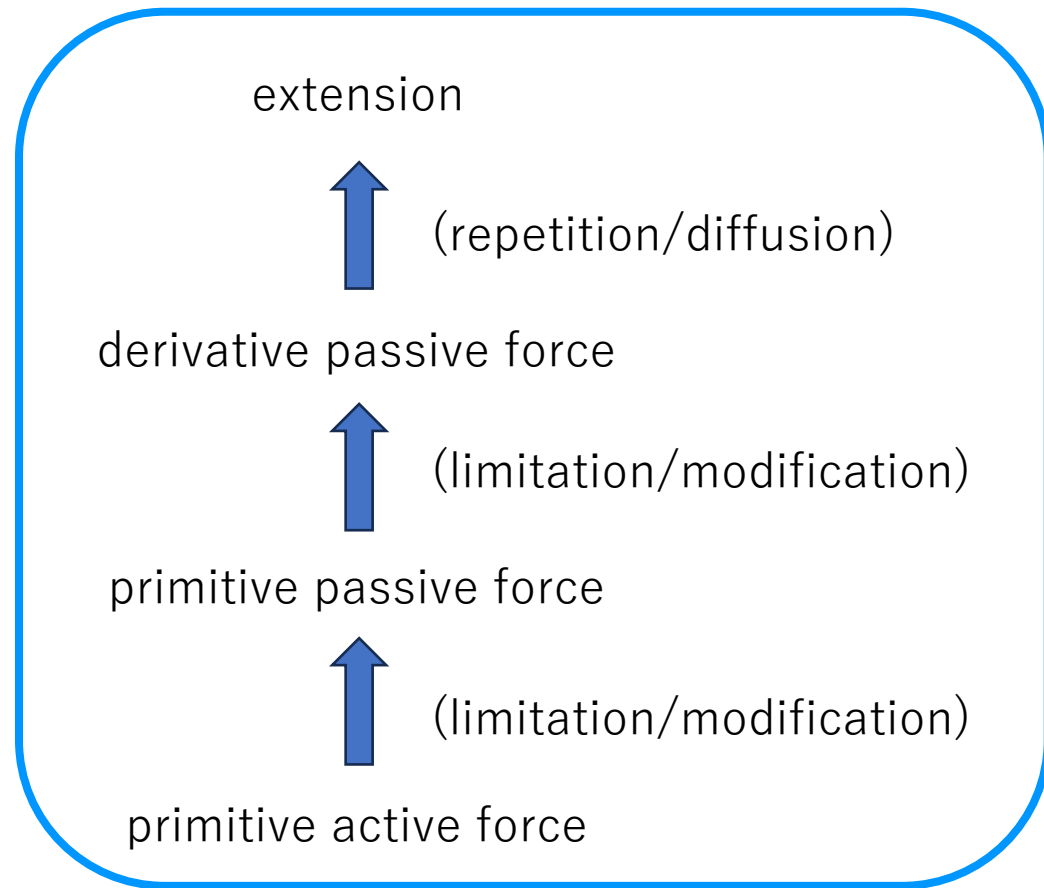
# Extension as the ‘result’ of primitive forces

- It is necessary that entelechies differ — *i.e.*, that they are not completely like one another. [20 June 1703] (LDeV, 263)
- Primitive and derivative forces are not in causal relation, but they are in **resulting relation**.
- Derivative force is a force at the same dimension as physical extension (though there are several degrees of extension: physical extension and apparent extension differ in **scales**, since derivative forces as *conatus* are infinitely small and then invisible. On the other hand, ‘apparent’ extensions as figures or colors are visible).
- Therefore, extension is a result of modification of the primitive force.
- Leibniz analogizes the relationship between primitive and derivative forces to **the law of a series and its function of specifying a term in the series**: “primitive force is like the law of a series, and derivative force is like a determination that designates some term in the series”. [21 Jan. 1704] (LDeV 287)

# Extension as the ‘result’ of ‘modification’ of primitive forces

- In short, the extension of body is the unity of the whole that **results** from its being taken together (i.e. *aggregatum*), and its composition is the ***continuum apparens*** that any two parts of the body are not separated from each other. It is contrasted with *unum revera* (truly one). [10 Nov. 1703] (LDeV 275)
- Derivative forces are mere **modifications** of things (or modes of substances) and are therefore certain **limitations** of things, which cannot contain an absolute perfection. Thus, “derivative forces do not suffice without primitive entelechies” (LDeV 277-9).
- Extension is an attribute of substance, but its continual appearance is as a modification of things, and thus as a result of derivative passive forces. Of course, insofar as there is a unity in it, entelechy, or primitive active force, is involved as its substantial basis. Thus, **the extension of body is the result of the diffusion or repetition of derivative passive forces.**

### 3. Modeling Leibniz's Idea of Diffusion: Bottom-up Construction of Extension

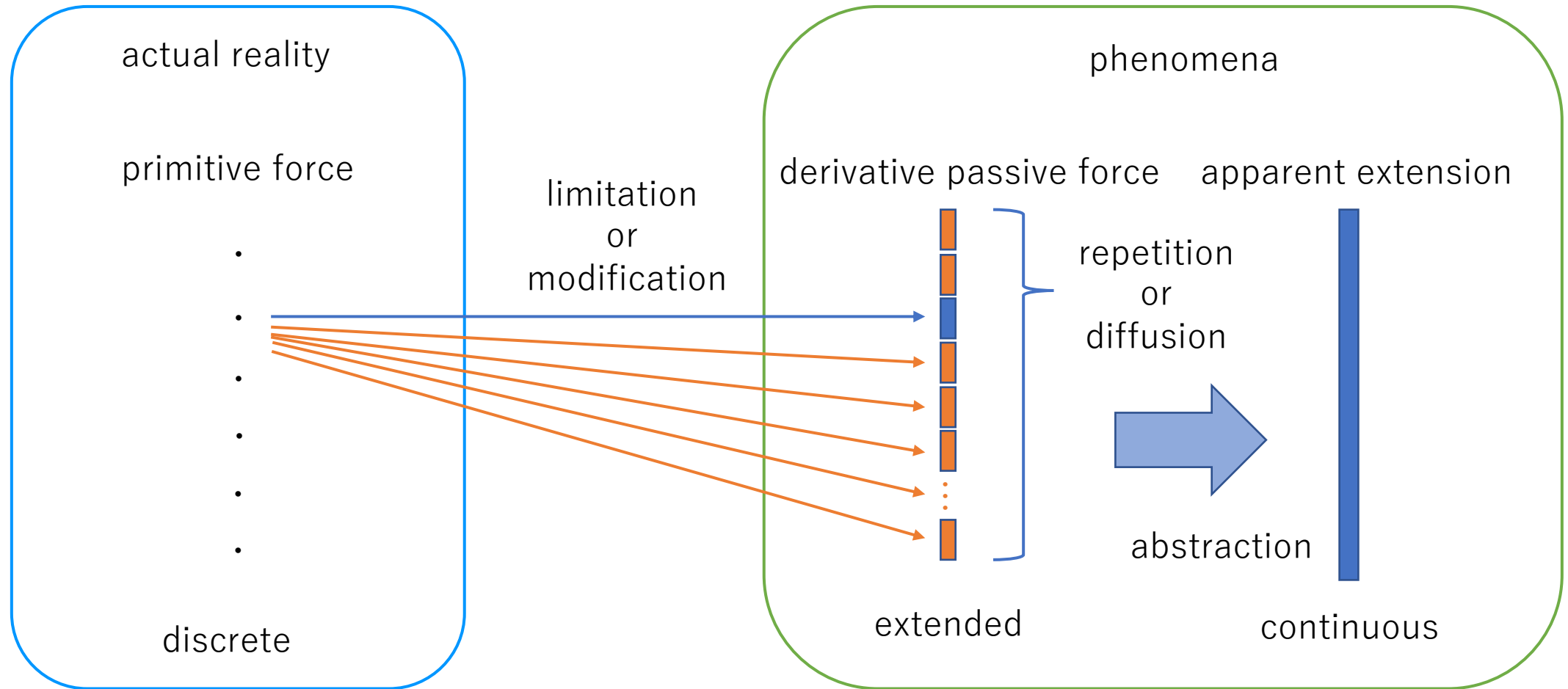


Thus, substantial or **primitive forces** that are originally heterogeneous each other are transformed into instantaneous or infinitely small **derivative forces** in the present, and their infinite diffusions or continuous repetitions **result** in **homogeneous extensions**.

↑ : relation of *resultans*



# Modeling Leibniz's idea of diffusion of forces





# A Consideration of the Resulting Relation

- We cannot specify what is precisely limited or modified since the primitive forces are diffused totally in the whole extension of a body without gaps.
- In other words, we cannot determine the inverse function of *resultans* *i.e.*, the limitation and modification.
- Therefore, **although we can suggest the structural correspondence** (which can be called *consensus* [agreement], consequence, resulting relation or expression) **between force** (that is, the nature of extension) **and extension as its diffusion, we cannot specifically trace back the process** through which the continuum is formed from the primitive force.

# A Consideration of the Resulting Relation

- We cannot look to Leibniz's metaphysics of force to show by what exact process a continuum is formed from a specific intrinsic force, since his metaphysics will not allow to draw such kind of causation in the first place.
- It can only be seen as an 'intellectual abstraction' from or a 'result' of unfolding the laws of force. The primitive force itself cannot be seen in a series (*i.e.*, extension) constituted by a diffusion or repetition of derivative force, which is nothing but modifications of the primitive force.

# Conclusion

Our question was: **how the extension of body is formed from diffusion of forces?**

For the late Leibniz, extension is a simultaneous and homogeneous diffusion (or repetition) of resistances (or passive forces) of the same nature.

**This nature that is supposed to be diffused, repeated, or continued is** that which constitutes physical body, and it can be found in nothing other than **the principle of acting and being acted upon**, since nothing else is suggested to us by the phenomena. (LDeV 305)

Thus, this nature consists in the principles of action and passion: primitive active force and primitive passive force.

Extension is also characterised as “an abstraction from that which is extended, and it is no more a substance than a number or a multitude can be considered a substance.”

# Conclusion

- The primitive forces (or entelechies or simple substances) are heterogeneous to each other. However, Leibniz says (LDV, 307):

“It is worth considering that this principle of action is most intelligible because there is something in it that is analogous to that which is in us, namely perception and appetite. For the nature of things is uniform and our nature cannot differ infinitely from the other simple substances of which the whole universe consists.”
- While there is a real/actual world of entelechies and monads that are intrinsically distinct, Leibniz also sees in the world a **principle of analogy**.
- This principle of analogy is nothing less than a pre-established harmony between reality and phenomena.

“the reality of which [the phenomena of perceivers] is located in the harmony of perceivers with themselves (at different times) and with other perceivers”.

# Conclusion

- The extension of the continuum cannot be ‘**composed**’ from mutually heterogeneous primitive forces, which serve as the principle of individuation.
- Instead, It is taken as a homogeneous quantity, i.e., the repetition or diffusion of derivative forces ‘**resulting**’ from these primitive forces.
- In other words, substantial force, as the source of motion and extension, is required as the true unity that makes these phenomena possible through its repetition and diffusion.
- Thus, force is the essence of the substance, the nucleus that resolves the labyrinth of the continuum.

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